Childhood Socioeconomic Status and Onset of Depression among Japanese Older Adults: The JAGES Prospective Cohort Study

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Objective: *Previous investigations on the impact of childhood socioeconomic status (SES) on depression have focused on middle-aged adults in Western countries. It is unknown whether childhood SES has a long-latency effect on the onset of depression among older adults.* **Design:** *Prospective cohort study.* **Setting:** *Data were from the Japan Gerontological Evaluation Study.* **Participants:** *We analyzed 10,458 individuals aged 65 years and older without depression (Geriatric Depression Scale <5) at baseline in 2010.* **Measurements:** *Participants rated their childhood SES at the age of 15 years according to standards at that time. We used binomial regression analyses with log link and with adjustment for known and potential risk factors to evaluate the risk of depression onset by 2013.* **Results:** *Overall, 13.9% of participants newly reported depression in 2013. After adjusting for age and sex, low childhood SES was positively associated with depression onset (adjusted risk ratio [ARR]: 1.44, 95% confidence interval [CI]: 1.23–1.69). The association decreased after adjustment for education (ARR: 1.33; 95% CI: 1.13–1.57). Even after adjustments for adult SES, current disease status, health behaviors, and social relationships, the association remained significant (ARR: 1.27; 95% CI: 1.08–1.50). The link was stronger among the younger old (65–74 years) than the oldest old (≥75 years).* **Conclusions:** *Low childhood SES, perhaps due to poverty in post–World War II, has a long-latency effect on the onset of depression among older Japanese adults. The impact of childhood SES on depression was weaker among the oldest old, suggesting survival effects for healthy older Japanese people.* (Am J Geriatr Psychiatry 2016; 24:717–726)

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Depression is a huge burden worldwide, and ranked as the fifth most common cause of disability-adjusted life-years for developed countries in 2013.[1] Depression among older adults leads to not only a deterioration of functional capacity, but also dementia.[2,3] To address an aging society, prevention of depression among older adults is needed, which in turn suggests a need for research on risk factors for depression.

Recent studies from life-course epidemiology suggest that childhood socioeconomic status (SES) is one of the important determinants of depression among middle-aged adults.[4–6] It remains unclear, however, whether childhood SES has any long-latency effect on the onset of depression among older adults—that is, persons aged 65 years or older. Although childhood financial hardship has been associated with mental disorder onset at every life-stage (childhood, adolescence, and adulthood), the magnitude of this association decreases significantly with age,[7] although results obtained with older adults are controversial.[8–11] One longitudinal study showed childhood food shortage predicted depressive symptoms in older age, independent of adult SES,[10] and another cross-sectional study showed no independent association between childhood financial status and depressive symptoms among older adults.[9] We know that the ability to exclude unwanted memories is reduced among older adults compared with younger adults (i.e., older adults are more likely to remember unwanted memories[12,13]), suggesting that older adults might better recall their childhood financial hardships and that previous studies may be biased. Thus, there is a need for investigation of the impact of childhood SES on depression among older adults using a prospective cohort study—namely, using older adults without depression to assess the impact of childhood SES on later onset of depression.

Moreover, the association between childhood SES and depression among older adults, which has been investigated mostly in Western society, may differ from that in other cultures, such as Japan. A previous study using a Japanese population reported that childhood economic adversity showed nonsignificant associations with the onset of mental disorder in middle-aged adults.[14] Alternatively, an age-cohort effect needs to be considered, and could be achieved by using older adults in Japan who survived World War II (WWII). Because the Japanese survivors of WWII showed a gradient inverse association between childhood SES and functional limitations,[15] those survivors who experienced lower childhood SES might be subject to a later onset of depression in older age.

The Japan Gerontological Evaluation Study (JAGES), performed in 2010 and 2013, is a large-scale, population-based prospective cohort study investigation of predictors of health, including depression, among healthy older people aged 65 years or over in Japan.[16] Participants were born before 1945, had survived food shortages and air attacks during WWII, and escaped from premature death before the age of 65 years. The data investigated childhood SES and depression in 2010, and reassessed depression in 2013. Using data from the JAGES, we examined the associations between childhood SES and the subsequent emergence of depression symptoms.

MATERIALS AND METHODS

Study Design and Subjects

In 2010, self-report questionnaires were mailed to community-dwelling individuals aged 65 years and older and sampled from 24 municipalities in 9 of the 47 prefectures throughout Japan. It was conducted using a random sampling method in the 14 large municipalities and administered to all eligible residents in the 10 small municipalities (target N = 141,452). The baseline sample in 2010 comprised 92,272 participants (response rate: 65%). Among them, 77,714 participants were targeted in the follow-up survey after the exclusions of participants who had died, received benefits from public long-term care insurance, or moved to another municipality during the follow-up period. Approximately 80% of the participants (N = 62,438) completed the follow-up self-report questionnaire in 2013. The mean follow-up period was 2.6 years. One-fourth of the participants (N = 14,738) were randomly selected to receive the survey module inquiring about childhood SES. The analysis set for the present study included 10,458 participants, after the following exclusions: participants missing responses to the questions related to childhood SES (N = 599); participants missing responses to all questions related to symptoms of depression (15-item Geriatric Depression Scale [GDS]) in the baseline survey (N = 66); and participants reporting symptoms of depression (defined as a score of ≥5 on the available items of the GDS in

the baseline survey (N = 3,615). The JAGES protocol was approved by the ethics committee on research of human subjects at Nihon Fukushi University (approval no. 10-05). Use of the data for this study was approved by the ethics committee of the University of Tokyo Faculty of Medicine (approval no. 10555).

Depressive Symptoms

Depressive symptoms were measured in both the baseline survey in 2010 and the follow-up survey in 2013. We used the Japanese version of the GDS-15[17] to measure the level of depressive symptoms in the older adults. The GDS uses a simple yes/no format suitable for self-administration.[18] In line with previous research,[16,19,20] participants were classified into two groups: non-depressed (GDS <5) and depressed (GDS ≥5). There were some missing items in both the 2010 and 2013 surveys for certain participants, however, so to identify those with newly developed depression during the follow-up period, respondents who scored 5 or higher with available data at baseline were excluded (N = 3,615), and we regarded the remaining 10,458 participants as the fixed eligible population. We then conducted multiple imputation analyses for this sample. At first, we generated 200 imputation data sets using the MICE (multiple imputation by chained equations) procedure.[21] Next, we analyzed each imputed data set as follows: we excluded participants classified as depressed (GDS ≥5) in 2010, and defined this at-risk population as the analysis set for this imputed data set. Finally, we defined the binary outcome of newly developed depression by the imputed GDS score from 2013. Results of the analyses of 200 data sets were synthesized by ordinary Rubin's formulae. Among these imputed data sets, the mean sample size of the analysis sets was 10,360 (range: 10,340–10,380) and the mean number of events was 1,435 (range: 1,403–1,458). (The mean proportion of participants with cumulative depressive symptoms was 13.9%; range: 13.6%–14.1%).

Childhood Socioeconomic Status

We asked participants to rate their childhood SES using the following question: "How would you rate your socioeconomic status at the age of 15 years according to standards at that time?" For example, 80-year-old respondents in 2010 would be recalling circumstances in 1945, when they were 15 years old. Responses were arranged on a 5-point Likert scale with verbal descriptors: high, middle-high, middle, middle-low, and low. We collapsed responses into three categories: high (including high and middle-high), middle, and low (including middle-low and low) to maximize the sample size for each category.[15]

Covariates

Potential mediators of the association between childhood SES and depression, such as years of schooling, adulthood SES, disease status, health behaviors, and current social relationships, were assessed by self-report questionnaire. Age was divided into four categories (65–69, 70–74, 75–79, and ≥80 years). Years of schooling were categorized into four groups (≤9, 10–12, ≥13 years, or other). Indicators of adulthood SES included longest-held occupation, categorized as non-manual (professional, technical, or managerial workers), manual (clerical, sales/service, skilled/labor, agricultural/forestry/fishery workers, or other), or no occupation;[22] current annual household income (<2.00, 2.00–3.99, or ≥4.00 million yen); and living situation (own home, renting, or other). Current disease status was assessed via a checklist of 21 disease conditions (multiple responses were allowed: cancer, heart disease, stroke, diabetes mellitus, respiratory disease, hypertension, obesity, hyperlipidemia, osteoporosis, joint disease/neuralgia, external injury/fracture, gastrointestinal disease, liver disease, psychiatric disease, dysphagia, visual impairment, hearing impairment, impaired excretion, sleep disorder, unidentified disease, and other). Psychiatric disease was incorporated in other current conditions as very few subjects (N = 65, 0.6%) reported that they were currently being treated for psychiatric disease. Health behaviors included smoking status (non-smoker, ex-smoker, or smoker), alcohol intake status (non-drinker, ex-drinker, or drinker), and walking time (<30 minutes/day or ≥30 minutes/day). The assessment of current social relationships included marital status (married, widowed, or divorced/unmarried/other); employment status (working, retired, or never worked); social participation in a variety of groups or activities (e.g., volunteer groups, sports groups, leisure activity groups, senior citizens' clubs, neighborhood

or residents' associations), as yes or no responses;[16] receiving emotional social support (present or absent) and general trust (yes, depends, or no).[23,24]

Statistical Analysis

After the follow-up period, the cumulative incidence rate of depression was over 10% in this cohort; therefore, odds ratio estimates obtained from ordinary logistic regression cannot be interpreted as relative risk measures, in general.[25] Instead, we used binomial regression analysis with log link for estimating adjusted risk ratios (ARR) and their 95% confidence intervals (CIs) directly.

The following four models were constructed for consideration: Model 1 was adjusted for age and sex; model 2 was additionally adjusted for education; model 3 was further adjusted for adult SES (longest-held occupation, current annual household income, and living situation); model 4 was additionally adjusted for disease status, health behaviors (smoking, alcohol, and walking time), and current social relationships (marital status, employment status, social participation, receiving emotional social support and general trust), as well as municipality of residence as a dummy variable. We also undertook additional analyses of multiple df tests for the variables that had multiple (i.e., three or more) categories using the Meng and Rubin procedure[26] for multiply imputed data sets.

For sensitivity analysis, we stratified further by age group, using the younger old (<75 years old, N = 6,826) versus the oldest old (75 years or older, N = 3,632), because we suspected that the impact of childhood SES on mortality might differ for those who experienced WWII before adolescence (i.e., <75 years old) versus after adolescence (75 years or older).

In all of these analyses, we applied the multiple imputation methods for adequately addressing the missing outcome data described earlier. We also generated imputed data for missing covariates by the MICE procedure.[21] All of these results were synthesized according to Rubin's rule,[26] and confidence intervals and p values were calculated by the approximation using t distribution quantiles with the degrees of freedom obtained by Rubin's method.[26] All analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC) and R version 3.2.3 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Overall, 40.3% of participants reported low or middle-low SES in childhood, and 14.6% of participants reported high or middle-high SES (Table 1). Around half of participants had completed fewer than 10 years of formal schooling (43.4%) and had a manual job as their longest-held occupation (52.7%). Regarding current household income, 36.6% of participants earned less than 2 million yen per year. The majority of participants (89.6%) owned their own homes.

The results of binomial regression evaluating the impact of childhood SES and onset of depression are shown in Table 2. After adjusting for age and sex, participants from low childhood SES were 1.44 times more

TABLE 1. Characteristics of Older Japanese Participants (N = 10,458)

	N	%
Sex		
Men	4,878	46.6
Women	5,580	53.4
Age		
Younger (65–74 years) (birth year: 1936–1945)	6,826	65.3
Older (≥75 years) (birth year: ≤ 1935)	3,632	34.7
Childhood SES		
High or middle-high	1,526	14.6
Middle	4,713	45.1
Middle-low or low	4,219	40.3
Depressive symptoms in 2013 defined by available items of GDS		
Non-depressed (<5)	9,095	87.0
Depressed (≥5)	1,363	13.0
Education (years)		
High (≥13)	1,926	18.4
Middle (10–12)	3,662	35.0
Low (≤9)	4,537	43.4
Other	54	0.5
Missing	279	2.7
Occupation (longest-held job)		
Non-manual	2,005	19.2
Manual[a]	5,512	52.7
No occupation	361	3.5
Missing	2,580	24.7
Annual household income (million yen)		
High (≥4.00)	1,186	11.3
Middle (2.00–3.99)	3,728	35.6
Low (<2.00)	3,828	36.6
Missing	1,716	16.4
Living situation		
Own home	9,373	89.6
Rent home	678	6.5
Other	78	0.8
Missing	329	3.2

Notes: GDS: Geriatric Depression Scale; SES: socioeconomic status.
[a]Manual: Clerical, sales/service, skilled/labor, agriculture/forestry/fishery, or others.

TABLE 2. Adjusted Risk Ratio with 95% CI for Association of Childhood SES with Depression Onset in Older Japanese Adults (N = 10,458)

		Model 1		Model 2		Model 3		Model 4	
		ARR (95% CI)	p	ARR (95% CI)	p	ARR (95% CI)	p	ARR (95%CI)	p
Childhood SES	High or middle-high	ref*		ref*		ref*		ref*	
	Middle	1.13 (0.96–1.33)	0.13	1.08 (0.92–1.28)	0.33	1.09 (0.92–1.28)	0.32	1.07 (0.91–1.26)	0.42
	Middle-low or low	1.44 (1.23–1.69)	<0.001	1.33 (1.13–1.57)	0.001	1.32 (1.11–1.56)	0.001	1.27 (1.08–1.50)	0.005
Education (years)	High (≥13)			ref*		ref		ref	
	Middle (10–12)			1.10 (0.94–1.29)	0.25	1.05 (0.90–1.24)	0.53	1.04 (0.89–1.22)	0.61
	Low (≤9)			1.30 (1.12–1.51)	0.001	1.18 (1.01–1.38)	0.04	1.10 (0.93–1.29)	0.25
	Other			1.83 (1.07–3.10)	0.03	1.64 (0.96–2.78)	0.07	1.29 (0.77–2.17)	0.34
Adult SES									
Longest occupation	Non-manual					ref		ref	
	Manual					1.15 (0.99–1.33)	0.06	1.12 (0.97–1.29)	0.14
	No occupation					1.28 (0.98–1.67)	0.08	1.13 (0.84–1.50)	0.43
Annual household income (million yen)	High (≥4.00)					ref*		ref*	
	Middle (2.00–3.99)					1.16 (0.95–1.41)	0.14	1.16 (0.95–1.41)	0.15
	Low (<2.00)					1.40 (1.15–1.69)	0.001	1.32 (1.08–1.60)	0.006
Living situation	Own home					ref*		ref	
	Rent home					1.22 (1.03–1.46)	0.03	1.13 (0.93–1.36)	0.22
	Other					1.46 (0.92–2.31)	0.11	1.21 (0.77–1.91)	0.41

Notes: ARR: adjusted risk ratio; CI: confidence interval. The confidence intervals and pvalues (based on t statistics) in the multiple imputation analyses were computed by Rubin's approximation rule; degrees of freedom were obtained using the Rubin method.[26] The ref categories of variables for which multiple df tests were significant were indicated with an asterisk (*$p < 0.05$). All degrees of freedom were >10.[4]

Model 1: Adjusted for age and sex.

Model 2: Model 1 + adjusted for education.

Model 3: Model 2 + adjusted for adult and current SES (longest occupation, normalized current household income, and living situation).

Model 4: Model 3 + adjusted for disease status, health behaviors (smoking, alcohol, and walking time), social relationships (marital status, employment status, social participation, social support, and general trust), and municipality of residence.

likely to have depression compared with those who grew up in high childhood SES (model 1, Table 2). Adjusting for education slightly reduced the effect of childhood SES on depression onset, but the association remained significant (model 2, Table 2). Subsequently, adjustment for longest occupation, current household income, and living situation (representing adult SES) did not reduce the effect of childhood SES on depression onset (model 3, Table 2). Even after inclusion of current disease status, health behaviors, social relationships, and municipality of residence in model 4, low childhood SES remained significantly and positively associated with depression onset among older adults: Those with low childhood SES were 1.27 times more likely to have depression compared with those who had high childhood SES.

For the analyses stratified by age, the ARR of low childhood SES on depression onset among the oldest old adults (75 years or older) was 1.38, which was lower than that of the younger old adults (65–74 years), after adjusting for age and sex (Tables 3 and 4). The risk of depression onset remained significant in the final model among the younger old group (Table 3), whereas it became nonsignificant after adjusting for education in model 2 among the oldest old group (Table 4). The interaction terms of age and childhood SES were not significantly associated with depression onset ($p > 0.50$, $t < 0.60$ and $df > 10^4$ for all analyses). In addition, all the results of the multiple df tests were consistent with those of the single df tests (data not shown).

DISCUSSION

In this prospective cohort study of older Japanese individuals, we found that older adults with lower childhood SES had a higher risk of depression onset. This association remained even after controlling for education and adult SES, suggesting that low childhood SES had a long-latency effect on the onset of depression (i.e., after the age of 65 years). Our findings are in line with those reported in Iceland and Mexico, where food shortages and lack of sanitation facilities in childhood (both indicators of childhood poverty) were associated with depression among older adults.[10,11] One possible reason for this consistency is financial status of the household in childhood. Financial levels after WWII in Japan were severely low, and low SES in this study might be a good predictor of food shortages and deprivation of household sanitation facilities; the impact of this low childhood SES may have re-emerged in later life.

Our findings shed new light on the literature regarding the impact of childhood SES on later mental health. A previous Japanese study that examined data from the World Mental Health Japan (WMH-J) study showed a nonsignificant association between childhood SES and mental disorders.[14] Differences in participants and study designs between our study and the WMH-J may be responsible in part for the contradictory findings. First, the WMH-J included heterogeneous types of participants, aged 20 years and older, and 36% of participants were over the age of 60 years (born before 1943);[27] yet only 3.5% reported having experienced childhood economic adversity. In contrast, our study focused only individuals 65 years and older (born before 1945), and 40% reported having low childhood SES (Table 1). Thus, our study sample was relatively free from confounding cohort effects of different age strata, and was sufficiently powered to investigate the impact of low childhood SES in this group. Second, we assessed onset of depression using a prospective cohort design, while the WMH-J used a cross-sectional design, which could be biased by reverse causation (i.e., depressed adults may be less likely to remember low childhood SES[28]).

We found that the impact of low childhood SES on depression onset became nonsignificant in model 2 among the oldest old. This finding could be explained by survival selection: People subjected to adverse circumstances are likely to die at younger ages, leaving a selected population more likely to survive to old age.[29,30] That is, the participants with low childhood SES in this age group were more likely to have been exposed to adversities such as wartime food shortages and infectious diseases as children, and hence more likely to have died during younger ages (i.e., prior to the baseline of observation).

Mechanisms of the association between low childhood SES and later-life depression onset are not fully understood. We found that educational attainment slightly accounts for the effect of low childhood SES on later-life depression onset. Nonetheless, the long-latency effect is suggested by the persistence of a significant association in later life, even after controlling for education, adult SES, current disease status, health behaviors, and social relationships. One explanation is that the impact of low childhood SES on the

TABLE 3. Adjusted Risk Ratio with 95% CI for Association of Childhood SES with Depression Onset in Younger Old Adults (N = 6,826)

		Model 1		Model 2		Model 3		Model 4	
		ARR (95% CI)	p	ARR (95% CI)	p	ARR (95% CI)	p	ARR (95% CI)	p
Childhood SES	High or middle-high	ref*		ref*		ref*		ref*	
	Middle	1.09 (0.87–1.36)	0.46	1.06 (0.85–1.33)	0.61	1.05 (0.84–1.31)	0.68	1.05 (0.84–1.31)	0.68
	Middle-low or low	1.48 (1.19–1.84)	<0.001	1.39 (1.11–1.74)	0.004	1.34 (1.07–1.68)	0.01	1.30 (1.04–1.63)	0.02
Education (years)	High (≥13)			ref*		ref*		ref	
	Middle (10–12)			0.98 (0.81–1.19)	0.84	0.94 (0.77–1.14)	0.52	0.94 (0.78–1.14)	0.54
	Low (≤9)			1.21 (1.00–1.46)	0.05	1.09 (0.89–1.32)	0.42	1.02 (0.83–1.24)	0.86
	Other			1.70 (0.78–3.70)	0.18	1.50 (0.70–3.23)	0.30	1.25 (0.57–2.74)	0.58
Adult SES									
Longest occupation	Non-manual					ref*		ref*	
	Manual					1.13 (0.94–1.36)	0.19	1.09 (0.91–1.31)	0.33
	No occupation					1.15 (0.76–1.73)	0.51	1.04 (0.67–1.60)	0.87
Annual household income (million yen)	High (≥4.00)					ref*		ref*	
	Middle (2.00–3.99)					1.20 (0.92–1.55)	0.17	1.21 (0.93–1.57)	0.16
	Low (<2.00)					1.54 (1.19–1.98)	0.001	1.45 (1.12–1.88)	0.005
Living situation	Own home					ref*		ref	
	Rent home					1.28 (1.02–1.60)	0.03	1.15 (0.90–1.47)	0.26
	Other					1.48 (0.82–2.66)	0.19	1.20 (0.66–2.17)	0.55

Notes: ARR: adjusted risk ratio; CI: confidence interval. The confidence intervals and p values (based on t statistics) in the multiple imputation analyses were computed by Rubin's approximation rule; degrees of freedom were obtained using the Rubin method.[26] The ref categories of variables for which multiple df tests were significant were indicated with an asterisk (*p < 0.05). All degrees of freedom were >10.[4]

Model 1: Adjusted for age and sex.

Model 2: Model 1 + adjusted for education.

Model 3: Model 2 + adjusted for adult SES (longest occupation, normalized current household income, and living situation).

Model 4: Model 3 + adjusted for disease status, health behaviors (smoking, alcohol, and walking time), social relationships (marital status, employment status, social participation, social support, and general trust), and municipality of residence.

TABLE 4. Adjusted Risk Ratio with 95% CI for Association of Childhood SES with Depression Onset in the Oldest Old Adults (N = 3,632)

		Model 1		Model 2		Model 3		Model 4	
		ARR (95% CI)	p	ARR (95% CI)	p	ARR (95% CI)	p	ARR (95% CI)	p
Childhood SES	High or middle-high	ref*		ref*		ref*		ref*	
	Middle	1.19 (0.94–1.51)	0.15	1.11 (0.87–1.42)	0.38	1.13 (0.88–1.44)	0.33	1.09 (0.86–1.40)	0.47
	Middle-low or low	1.38 (1.08–1.76)	0.009	1.26 (0.98–1.62)	0.07	1.27 (0.99–1.64)	0.07	1.21 (0.94–1.56)	0.14
Education (years)	High (≥13)			ref*		ref*		ref	
	Middle (10–12)			1.35 (1.03–1.77)	0.03	1.30 (0.98–1.71)	0.07	1.28 (0.97–1.69)	0.08
	Low (≤9)			1.48 (1.14–1.91)	0.003	1.37 (1.04–1.80)	0.03	1.28 (0.97–1.69)	0.08
	Other			2.00 (0.96–4.20)	0.07	1.84 (0.87–3.89)	0.11	1.47 (0.70–3.10)	0.31
Adult SES									
Longest occupation	Non-manual					ref*		ref*	
	Manual					1.17 (0.91–1.49)	0.22	1.13 (0.89–1.44)	0.31
	No occupation					1.38 (0.94–2.03)	0.10	1.18 (0.78–1.80)	0.43
Annual household income (million yen)	High (≥4.00)					ref*		ref*	
	Middle (2.00–3.99)					1.12 (0.83–1.51)	0.47	1.10 (0.81–1.48)	0.56
	Low (<2.00)					1.23 (0.92–1.66)	0.17	1.17 (0.87–1.59)	0.30
Living situation	Own home					ref		ref	
	Rent home					1.15 (0.87–1.52)	0.33	1.08 (0.80–1.47)	0.61
	Other					1.47 (0.71–3.06)	0.30	1.20 (0.57–2.54)	0.63

Notes: ARR: adjusted risk ratio; CI: confidence interval. The confidence intervals and p values (based on t statistics) in the multiple imputation analyses were computed by Rubin's approximation rule; degrees of freedom were obtained using the Rubin method.[26] The ref categories of variables for which multiple df tests were significant were indicated with an asterisk (*$p < 0.05$). All degrees of freedom were >10.[4]

Model 1: Adjusted for age and sex.

Model 2: Model 1 + adjusted for education.

Model 3: Model 2 + adjusted for adult SES (longest occupation, normalized current household income, and living situation).

Model 4: Model 3 + adjusted for disease status, health behaviors (smoking, alcohol, and walking time), social relationships (marital status, employment status, social participation, social support, and general trust), and municipalities of residence.

onset of depression might be covered by social support during middle age, but finally revealed only after individuals have faced stressful events of later life, for example, bereavement, loss of social role by retirement, declines in health and income, and independence of children. Another mechanism may relate to difficulties in memory control with age. When reminded of something individuals would prefer not to think about, control of the unwanted memories is initiated by the lateral prefrontal cortex, which acts to reduce activity in the hippocampus.[13,31] The ability to exclude awareness of unwanted memories declines with advancing age, suggesting that older adults failed to inhibit the to-be-avoided memories,[12] which could be a risk factor for depression.[32,33] In the context of our study, the participants with low childhood SES may have been exposed to unwanted memories such as wartime experience.

Several limitations of this study should be mentioned. First, as with any study that relies on self-report, we assessed childhood SES via subjective recall. Previous research, however, supports the reliability of retrospective assessments of childhood SES using siblings' recall of childhood SES,[34] and subjective SES has been found to be a better predictor of health status than objective SES.[35–37] Moreover, we confirmed that childhood subjective SES was correlated with other objective indicators of deprivation such as height and SES achieved in adulthood.[38] Second, information on wartime and post-WWII adverse experiences, such as experiences of air attack or death in the family, were not assessed. Given the number of potentially confounding factors that we could not account for, our results should be interpreted with caution. Third, the generalizability of the results may be weak because the present analyses used data from participants who responded to both the baseline and the follow-up survey. The analyzed participants were younger and had higher socioeconomic status and better social relationships than did those in the baseline sample.[16] This suggests that our sample underrepresented participants who were vulnerable to depression, which may have led us to underestimate the effect of childhood SES on depression. Finally, the survey sample included healthy older adults, and therefore the results could be affected by survival selection bias, which also may have led to underestimates of the effect of childhood SES on depression if those with poorer circumstances died earlier.

In conclusion, our study demonstrates a long-latency effect of low childhood SES on the onset of depression in an older population and provides additional evidence for the importance of implementing policies against child poverty. The evidence on socioeconomic deprivation in early life may not be transferable to other generations and cultures. Whether low childhood SES is a risk factor for onset of depression in older age would seem to depend on the specific historical context, for which this cohort of Japanese who grew up during and after WWII provides an illustrative example. Further study is warranted to replicate the long-latency effect of low childhood SES on the onset of depression among older adults in other settings.

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